3. Detailed Description of the Invention

[Industrial Application Field]

The present invention relates to an ink jet printer device using ink that is mixed with a UV curable resin.

[Prior Art]

One major problem associated with ink jet printers using liquid ink concerns the time it takes for the ink to dry.

Conventionally, to deal with this problem, an alkaline ink or the like is used to make the ink permeate into paper faster, or ink is mixed with a UV curable resin to thereby enable the ink to be cured by irradiation with UV light after printing. In this conventional technique using a UV curable ink, as a printed paper is conveyed by a paper feed roller, printed lines on the paper are irradiated with UV light from a UV lamp that is provided in parallel relation to a platen, so as to expedite ink curing. However, since UV light is irradiated on a broad area, a UV lamp used in this conventional technique consumes a lot of electric power. As a result, the overall power consumption by such a printer becomes large. Further, the printer also has a disadvantage in size reduction. Therefore, in view of size and cost, the UV lamp is not suitable for use in a printer having a broad range of printing area.

[Problem to be Solved by the Invention]

Objects of the present invention are: to cure a UV curable ink in a sufficiently short time, even using a UV lamp of a low power, thereby reducing power consumption; to reduce the overall size of a printer; and to broaden a printing area regardless of the size of the UV lamp.

[Means for Overcoming the Problem]

In the present invention, UV light emitted by a UV light source is converged on a small area and is directly irradiated on UV curable ink printed on a paper immediately after printing, the UV light source being located at about 1.0 to 1.8 mm from the paper. To converge light rays from the UV light source, the present invention utilizes the so-called principle of integrating sphere; that is, the light source is placed in a case, inner walls of which are covered with metal plates,

magnesium oxide, or the like. Further, the present invention uses optical fibers for transmitting light rays and irradiating them from sides of the print head.

[Operation of the invention]

In the present invention, light from the UV light source is integrated by reflector plates and converged by optical fibers, lens, or the like onto a small area, to thereby cure a UV curable ink. The present invention uses a so-called integrating box to transmit the UV light from the UV light source to the optical fiber with a minimum loss of light energy. The integrating box has inner walls to which metal plates or the like made of a high-reflectance material are attached, and a light source is placed in this integrating box, such that light energy is taken out through a small opening of the box, using the optical fibers, lens, or the like.

[Embodiment]

Fig. 1 is a schematic view of an embodiment of the present invention. A print head 5 is driven by a carriage motor 4 using a carriage belt 7. A paper 1 is guided in its longitudinal direction by a paper feed roller 2 that is driven by a paper feed motor 3. A constant distance between the paper 1 and the print head 5 is maintained by a paper holder 6 and a guide shaft 12. The present invention is a jet-ink type in which ink is supplied, by means of a differential pressure, from an ink tank 9 through an ink supply pipe 8. A UV light source is disposed in a light source unit 11 that has inner walls of chromium-coated metal plates to serve as an integrating box. UV rays are transmitted through a plurality of optical fibers 10 of about 0.3 to 0.8 mm in diameter that are disposed on left and right sides of the print head 5, the optical fibers 10 being arranged in parallel relation to print nozzles and in perpendicular relation to a surface of the paper. The distance from tips of the nozzles of the ink jet head to the surface of the paper is set to be about 1.0 to 1.8 mm, the same as the distance from tips of the optical fibers to the surface of the paper.

For the optical fibers, a glass-fiber type material mainly based on SiO_2 or the like is used to reduce a loss in UV energy. Apart from the chromium coating, a material having a high reflectance in a UV range, such as magnesium oxide powder, can be used on the inner walls of the light source unit 11.

Fig. 2 is an enlarged view of the print head portion of the present invention. Normally,

the printing process can be conducted in left and right directions depending on data to be printed. Therefore, as shown in Fig. 2, the optical fibers are disposed on both sides of the print head. However, the optical fibers may be disposed only on one side, if the printer device is used to print in only one direction. A print head 13 has four nozzles and six optical fibers 10. Under a condition in which the surface tension of ink to be used is less than or equal to 3.5×10^{-2} Pa.s, the ink spreads over the surface of the paper. In this case, the nozzles and the optical fibers may not necessarily be provided in equal number.

[Effects of the Invention]

The printer device of the present invention is capable of converging UV energy on a small area and irradiating UV light on a surface of a paper at a close distance immediately after printing. Therefore, compared to a conventional printer, a lower power of a light source is required for the printer device of the present invention. Further, unlike the conventional example shown in Fig. 3, a range of printing area is not limited by a UV lamp. Normally, the price of the UV lamp increases with size. Therefore, the present invention is advantageous in cost when used for a large printer such as a 130-column printer.

4. Brief Description of the Drawings

Fig. 1 is a schematic view of an ink-jet printer device according to an embodiment of the present invention.

Fig. 2 shows a head portion of the ink-jet printer device of the embodiment.

1: paper

2: paper feed roller

3: paper feed motor

4: carriage motor

5: print head

6: paper holder

7: carriage belt

8: ink supply pipe

9: ink tank

10: optical fiber

11: light source unit

12: guide shaft

13: print head

14: nozzle